What is Claimed is:

1. A method of selecting paths comprising the steps of:

a) computing a plurality of first shortest paths from a source point to a destination point each including of a serial chain of at least one communications link;

b) selecting K first shortest paths from the plurality;

c) ordering the selected K first shortest paths from shortest to longest;

d) for each first shortest path of K,

i) computing the cost of the first shortest path as substantially equal to the combined cost of the links included in the first shortest path;

ii) selecting a lowest estimated cost second shortest path from the remainder of the elements of K, where the estimated cost of the second shortest path is computed as substantially equal to the combined estimated cost of the links included in the second shortest path and the cost of a link corresponds to the cost of using the link scaled by a probability that the link can be shared by the second shortest path and a path already provisioned using a channel of the link;

e) selecting the lowest estimated combined cost first and second shortest path pair.

2. The method according to claim 1, wherein for a second shortest path, the cost of a link is estimated by;

a) assigning an infinite cost to a link included in an associated first shortest path;

b) assigning an infinite cost to a link that traverses at least one shared-risk-group (SRG) traversed by an associated first shortest path;

c) assigning to a link not having an available shared protection channel a cost substantially equal to the cost of allocating an additional shared protection channel to the link;

d) estimating for a link having at least one available shared protection channel a cost corresponding to the cost of using the link scaled by a probability that the link can be shared by the second path under consideration and no backup paths already provisioned using the link.

3. The method of claim 2 wherein the probability that the link can be shared by the second path under consideration and no backup path already provisioned using the link is determined according to a method comprising;

a) creating a variable M, and assigning as its value the number of available shared protection channels in the link;

b) for each j from 1 to N;

i) creating an array of N elements, SRG_j, consisting of the N SRGs traversed by a proposed primary path;

ii) creating an array of N elements, n_j, consisting of the number of times SRG_j is traversed by a primary path protected by a backup path already provisioned using channels of the link;

c) computing a probability, p, that one available shared protection channel of a link can be shared by a second shortest path and one backup path already provisioned using the channel as $p=\prod_j(1-n_j/M)$, for j from 1 to N;

d) computing a probability, P, that no available shared protection channel of a link can be shared by a second shortest path with a backup path already provisioned using a channel of the link as $P=(1-p)^M$.

4. The method according to claim 1, wherein the lowest cost path pair is selected according to a method comprising;

a) defining an array of K elements, w_i, where i ranges from 1 to K, including the ordered K first selected paths;

b) defining an array of K elements, si, where i ranges from 1 to K, including the K second shortest paths associated with the ordered K first selected paths;

c) defining a set, K, comprised of elements {wi,si}, where i ranges from 1 to K;

d) computing the combined estimated cost of the elements of set K, and ordering the elements from lowest combined estimated cost to highest combined estimated cost;

e) selecting the lowest combined estimated cost path pair in set K.

5. A method of selecting paths comprising the steps of:

a) creating a first graph representing a network having a topology containing network elements interconnected by communications links wherein each network element is represented by a vertex and each communication link interconnecting adjacent network elements is represented by an edge, the first graph containing a source vertex corresponding to an ingress network element and a destination vertex corresponding to an egress network element;

b) using the first graph to calculate a plurality of paths between the source and destination vertices;

c) selecting K first shortest paths between source vertex and destination vertex;

d) for each first shortest path;

i) computing the cost of the first shortest path;

ii) creating a second graph substantially based on the first graph wherein the second graph includes edges and estimated edge costs and an edge associated with the first shortest path is modified from the first graph;

iii) selecting a lowest estimated cost second shortest path from source vertex to destination vertex from the second graph wherein the estimated cost of the second shortest path is substantially equal to the combined estimated costs of the edges comprising the second shortest path and the estimated cost of an edge corresponds to the cost of using the edge scaled a probability that the edge can be shared by the second shortest path and a path already provisioned using a channel of the edge;

e) selecting the lowest estimated combined cost first and second shortest path pair.

6. The method according to claim 5 wherein an edge associated with the first shortest path is modified by removing it from the second graph.

7. The method according to claim 5 wherein an edge associated with the first shortest path is modified by setting its estimated edge cost to a very high value.

8. The method according to claim 5 wherein an edge associated with the first shortest path is modified by setting its estimated edge cost to an infinite value.

9. The method according to claim 5 wherein the K first shortest paths are ordered from lowest cost to highest cost and assigned to elements w_i, of set K, where i ranges from 1 to K.

10. The method according to claim 5, wherein for each first shortest path a least estimated cost second shortest path is chosen from the second graph and for each second shortest path in a second graph, the cost of a link is estimated according to a method comprising;

i) assigning an infinite cost to an edge that traverses at least one SRG traversed by the first shortest path;

ii) assigning to an edge without an available shared protection channel a cost substantially equal to the cost of adding an additional shared protection channel to the edge;

iii) estimating for an edge having at least one available shared protection channel a cost corresponding to the cost of using the edge scaled by a probability that the edge can be shared by the second path under consideration and no backup paths already provisioned using the edge.

11. The method of claim 10 wherein a probability that an edge can be shared by a second shortest path and no backup paths already provisioned using channels of an edge is estimated by;

a) creating a variable, M, and setting its value to the number of available shared protection channels in the edge;

b) for each j, where j ranges from 1 to N;

i) creating an array of N elements, SRG_j, consisting of the N SRGs traversed by a proposed primary path;

ii) creating an array of N elements, n_j, each consisting of the number of times SRG_j is traversed by a primary path protected by a backup path already provisioned using channels of the edge;

c) computing a probability, p, that one available shared protection channel of an edge can be shared by a second shortest path and one backup path already provisioned using the channel as $p=\prod_j(1-n_j/M)$;

d) computing a probability, P, that no available shared protection channel of an edge can be shared by a second shortest path with a backup path already provisioned using a channel of the edge as $P=(1-p)^M$.

12. The method of claim 5, wherein a lowest estimated combined cost first and second shortest path pair is selected according to a method comprising;

a) creating a set, S, with K elements $\{w_i,s_i\}$, where i ranges from 1 to K, including the K first shortest paths, w_i, and K associated selected second shortest paths, s_i;

b) for each first shortest path, w_i, where i ranges from 1 to K;

i) computing a cost substantially equal to the combined cost of the links included in the first shortest path;

ii) computing an estimated cost for the associated selected second shortest path substantially equal to the combined estimated cost of the links comprising the selected second shortest path;

c) ordering the elements of set S from lowest combined estimated cost to highest combined estimated cost;

d) selecting the lowest combined estimated cost path pair.

13. A shared mesh protection network wherein paths are provisioned according to a method comprising;

a) generating a list of at least one candidate pair of paths including one primary path and one associated backup path between a source network element and a destination network element;

b) selecting a lowest estimated path pair from the list where the cost of the primary path is substantially equal to the cost of the network resources included in the primary path and the estimated cost of a backup path corresponds to the cost of the network resources included in the backup path scaled by the probability that existing network resources can be shared by the backup path;

c) using signaling to attempt to establish the selected path pair;

d) eliminating the selected path pair from the list if it can not be established and attempting to establish a new lowest estimated cost path pair;

e) returning an error signal to a network operator if no candidate path pair from the list can be allocated.

14. The network of Claim 13 wherein path provisioning is controlled by the source network element and signaling is used between the source network element and each network element in a proposed pair of primary and backup paths to establish links between adjacent network elements.

15. The network of claim 14, wherein said signaling is comprised of the steps of;

a) for each network element in the primary path, sending from the source network element to the network element a request for the network element to establish a link with adjacent network elements;

b) for each network element in the backup path, sending from a source network element to the network element a request for the network element to establish a link with adjacent network elements;

c) for each network element in the primary path that can not establish a link to an adjacent network element, sending from the network element to the source network element an error signal;

d) for each network element in the primary path that can establish a link to an adjacent network element, sending from the network element to the source network element a valid link signal;

16. The network of Claim 13 wherein the network has a single network controller and signaling between the controller and network elements is used to provision primary and backup paths.

17. The network of claim 13, wherein reallocation of existing network resources is initiated at any time.

18. The network of claim 13, wherein reallocation of existing network resources is initiated at each request of new communications service.

19. The network of claim 13, wherein reallocation of existing network resources is initiated at regularly scheduled intervals.